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of colic, laying down and kicking, bellowing, twisting, braced stance, increased salivation, and collapse into a coma. Death followed the onset of clinical signs in 24 to 48 hours. At necropsy, two calves showed an acute hemorrhagic abomasitis which resembled the gastritis often seen in dogs which die of PR after eating pigs which died of the disease. None of the calves showed any signs of frank pruritus and itching. During the clinical phase in the calves, their dams had constantly nosed and licked them, but no clinical signs of PR were observed in these cows. After the deaths of the seven calves, the farmer moved the herd away from the swine lots and the eleven remaining springers all had normal calves which have remained healthy to the present time.

The second case report presented an interesting aspect of this pseudorabies outbreak. The clinical signs the calves exhibited would allow it to be confused with indigestion, colibacillosis, rabies, or *Clostridium perfringens* type C enterotoxemia. This form of PR was more similar to the clinical form seen in suckling pigs and may be age related. Since it appeared that the exposure was by inhalation rather than by ingestion, it may also be related to the route of exposure.

The PR outbreak at Hubbard, Iowa has raised a number of questions. In this outbreak, one must wonder why the cows did not contract the disease. They could not have developed immunity from a previous illness or have had a subclinical form if PR is 100% fatal in cattle as reported in the literature. Further studies are needed on whether calves with clinical disease, such as these had, actually shed virus and whether adult cattle are susceptible to intranasal exposure to PR. It is important that bovine practitioners be alert to possible nasal transmission of PR virus from swine to cattle and to a form of the disease in cattle which may not be a characteristic "mad itch".

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The Effect of Artificial Lighting on the Estrous Cycle of the Mare

by
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Although we find a wide range of estrous cycling patterns, the mare is usually considered seasonally polyestrous—cycling only during certain seasons of the year. In the natural state, the seasonal breeding was advantageous to the survival of the foals as they were born during the spring and summer with moderate temperatures and adequate food supply. Today's well-managed horse farms with complete nutrition programs and indoor facilities have alleviated the pressure for such selective patterns, but due to the relatively short evolutionary period of domestication, the seasonal pattern predominates.[6]

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The typical mare cycles regularly between March and October with each estrous period being an average length of twenty-one days.[3] The period of estrus or acceptance of the male tends to be longer in the spring (an average of eight days) as opposed to summer and fall (an average of five days).[3] Ovulation usually occurs within twenty-four to forty-eight hours prior to the end of estrus.[3] For the sake of completeness, it should be noted that some mares show true estrus regularly throughout the entire year.[6]

Of all the domestic species, the mare exhibits the poorest correlation between reproductive behavioral patterns and endocrine physiology.[6] This deviation is common from November to March and especially exaggerated during January and February when only about 20% of mares have normal estrus.[6] Generally, during this winter period of anestrus, the ovaries of barren mares are very hard and inactive and their genital tracts are pale and quiescent.[8]

In 1946, Dr. John Burkhardt carefully traced the ovarian changes of barren pony mares as they were leaving this anestrous period. He found that there was a gradual transition from "deep anestrus, to shallow anestrus, to estrus."[2,8] The first clue to the onset of estrus was a palpable increase in ovarian size and a change to spongy consistency. The ensuing follicular development and behavioral estrus were associated with shedding of the winter coat. Unfortuantely, very erratic reproductive patterns occur during this transition from true anestrus to true estrus and serve to frustrate attempts at early conception. Mares may be in heat for six weeks without any follicular activity, show split estrus, or produce multiple follicles.

There are many different factors which influence the recurrence of the estrous cycle of the barren mare. One which is considered to have an important direct effect is the amount of daylight. In nature, the increasing daylight was the clue for the onset of the breeding season. This is called sexual periodicity.[8] The mediation for this external stimulus is thought to involve the pituitary gland. Research indicates that the light rays affect the eyes as they do in ferrets and the stimulus is passed via the retina to the pituitary by nervous paths.[2] In one controlled experiment, ponies which were hooded to prevent light from entering their eyes showed no response to the light effect. On the contrary, wall-eyed pony mares, those having no pigment present in the iris of either eye, showed a markedly faster response to the light than the ponies with normally pigmented eyes. It was thought that the absence of pigment allowed for more visible and ultra-violet light to reach the retina of the eye and enhance the response.

It has been established that by artificially increasing the daily amount of light to which the mare is exposed during the winter months, she can be moved ahead in her seasonal cycle. Thus, those cycling abnormalities associated with the transition from anestrus to estrus in the natural breeding season still occur, but at a much earlier time. Hence, the mare attains an earlier fertile estrus. Doctors Loy and Fallon, who have researched this topic in the United States, believe that the mare's estrous cycle is directly related to the length of daylight to which she is exposed. Their explanation is that the pituitary gland releases more follicle stimulating hormone in response to the increased amount of daylight. I could not find any mention of the role of the hypothalamus; however, since it produces the releasing factor for FSH, it may be involved.

In the literature, it was repeatedly stressed that the sole benefit from artificial lighting was an increased number of estrous cycles in any given breeding season.[7,8] This effect can be used to advantage in many aspects of brood mare management. First of all, the earlier fertility results in earlier foals which is particularly desirable in the racing breeds due to their arbitrary January 1 birth dates. The young racing hopefuls are allowed additional time for development and maturation. By distributing the mares over a longer breeding season, the usefulness of a particular stallion can be extended and this can be especially important when artificial insemination is not allowed. If a greater percentage of the mares are settled by May, the stallion is available for in-

creased coverage of infertile, problem mares. Dr. Kaufman, resident DVM for Claiborne Farm, states that using the lights gives an additional fifteen to twenty-five days of good, ovulatory heat per breeding season.

Once common misconception is that artificial lighting has curative properties for problem mares.[6,8] It does not! If it is impossible to settle a mare throughout the breeding season under natural conditions, lights are not the answer.

The procedures for optimal results from using artificial lighting are still under experimental trials. The regulation is very complicated and should be used with a great deal of caution. It is still not known what characteristics of increasing daylight provide the stimulus. All types of programs have been used varying from automated to manually controlled, from continuous lighting to intermittent periods of light, from fluorescent to incandescent bulbs.

It is generally conceded that gradually increasing a period of light gives better response than continuous lighting, but that either system was a marked improvement over no lights at all. Increases varying from 15 minutes to one hour per week starting in December and continuing to May with a final nineteen hours of light per day were suggested. It was found that most mares became fertile within forty to one hundred days of initiation of the lighting program. [5] Hence conception could occur beginning in February.

Understandably, automated control is preferred over manual switching due to the importance of regularity. Fluorescent, incandescent, and quartz bulbs all produced equally satisfactory results so long as seven to fifteen foot-candles (200 watts) were provided for an average stall.[3,5] Four forty-watt fluorescent tubes could be substituted for a two hundred watt incandescent bulb.[7] One author preferred a standard two hundred-fifty watt white heat bulb per stall.[7] It should be noted that the minimal increase in temperature does not play any significant role.[2]

I would like to include a lighting schedule prepared by Doctors Loy and Fallon for barren mares.[7]

		LIGHTS OFF
December	1	7:00 P.M.
December	8	7:45 P.M.
December	15	8:30 P.M.
December	22	9:15 P.M.
December	29	9:30 P.M.
January	5	9:45 P.M.
January	12	10:00 P.M.
January	19	10:15 P.M.
January	26	10:30 P.M.
March	2	11:45 P.M.
March	9	12:00 P.M.
March	16	12:15 P.M.
March	23	12:30 P.M.
March	30	12:45 P.M.
April	6	1:00 P.M.
May	1	LIGHTS OFF

In summary, the use of artificial light in gradually increasing the daily period of illumination for the barren mare causes an earlier seasonal fertile status. It is not beneficial in the case of the problem infertile mare.

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